

Appln. No. 09/401,681
Amdt. dated Oct. 18, 2004
Reply to Office Action of June 16, 2004

PATENT

REMARKS/ARGUMENTS

The Examiner is thanked for the further non-final action and the courtesy of an explanation. In response and in view of the further objections to claims that were believed to recite allowable subject matter, the Applicant has further amended the claim to clarify the invention without limiting it to the specific output or presentation mechanism. To this end, the Applicant seeks reconsideration of the claimed invention as a method for the simulation of living organisms employing a hierarchical structure, the underlying principle of which recognizes features of living organisms and departs from the art previously applied and asserted to recite methodology suggestive of the present invention. The claims present a form for modeling life forms and recite significant elements of the model and the interaction of the elements. The subject matter of the invention as now claimed represents a patentable advance in the art.

The Applicant's contention is that there has never before been the recognition that a living organism can be simulated in a computer system by a model comprising a set of nodes in a nested hierarchy of interrelationships, wherein each node is characterized by the *same type of control principle*: Each operation of the nodes of the model seeks to achieve a zero error between actual activity of each input/output pair and a pre-established balanced ratio for each input/output pair that is defined in each node of the model. Inherent in this model is the assumption of the existence of a sensor for each input/output pair that notes the presence of imbalance as compared with a balance point, a pre-established ratio, and the existence of an actuator that causes the node to change state through a change in allowed input, generated output or some external process (such as application or extraction of heat in the entire environment).

While the Specification supports other applications known in the art as complex systems, at this time the claims are limited to the simulation of the operation of living organisms. It is inherent in the claims that the fundamental building blocks of the living organisms exhibit a critical point in thermodynamic energy as found at a second order phase transition. This invention allows for the simplification of simulations of the complex systems herein disclosed such as life forms, in particular eukaryotic cellular structures (Specification page 1, lines 20-22), based on a single underlying principle: self-organizing rate control at the nodular level. The

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invention is summarized as following the principle of balanced self-organization in a system with both a conservation law and energy dissipation, which becomes "organized" when a "critical point" of energy input and energy output is achieved. (Spec. page 2, lines 19-27). In the context of the present claims, the critical point refers to a point in the thermodynamic energy state at which three phases coexist.

The claims have been amended to further clarify the invention and to point out uniqueness. For example, new claim 12 recites the living organism simulation system, including the specific step of modeling. New claim 13 asserts a claim to links supporting reciprocal feedback. While feedback is inherent in the operation of a control system, the recitation of reciprocal feedback in the claim points to a unique form due to the nature of the model with its hierarchical nature.

Claim 6 has been rejected under 35 U.S.C. 112, first paragraph. The Examiner has stated: "In the defining of a balanced state ... the zero error seems to correspond to a mathematical critical point in thermodynamic energy. Such a critical point reasonably is that energy which obeys the laws of thermodynamics, which apparently from all scientific measurements always are obeyed. Thus as defined, there is always zero error for each node in the simulation. Therefore there can be no sensing of a non-zero error thus making the claim lacking in enablement."

The present invention violates no laws of thermodynamics. The Examiner has misunderstood the recitation of the term "balanced state" and confused it with the term "balanced ratio." The term "balanced ratio" recognizes that a state exists which is a natural phenomenon. Specifically the claim recites that the balanced ratio is pre-established and corresponds to the critical point in thermodynamic energy (where for water three phases coexist due to a second order phase transition). That critical point is a natural phenomenon and is not a selectable state. Further as recited, the "balanced state," it the state of the node state represented by a logical value when the measured input and measured output, which are controllable parameters, match that which is part of the predetermined element of the model. Thus, the claim is not lacking in enablement.

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The Examiner has further objected to the last three lines of claim 6 regarding a depiction in five dimensions as never being able to be enabled. The Examiner has in effect stated that a depiction must be single unified, and presumably static image, which cannot be enabled. The Applicant respectfully traverses this objection as that is not what is meant. The depiction in five dimensions was assumed to be a trivial expression readily enabled within the meaning and scope of the claim. Nothing in the claim recites the exact nature of the depiction as related to a static image. In fact, the five dimensions are recited as three spatial dimensions, time and gray scale. In the specification, Figures 5A and 5B represent simplified structures depicted in multiple fractal dimensions. Thus, depiction in five dimensions is neither impossible nor uncommon. As understood by the Applicant and as generally accepted, depictions can be parallel tables, graphs, sounds, actions or any other expression, so long as the ordinate of each single dimension is orthogonal (by definition, independent) of every other ordinate. In this case, there could be a three-dimensional spatial depiction projected on a two-dimensional screen, a first time scale which is depicted as motion and a gray scale for each element admitting to shading, all in a single graphical presentation. However, it could just as easily be "depicted" by means of numerical values in an $N \times 5$ matrix, where each column represents a dimension, which a common depiction employed in linear algebra, or in a collection of five sets of five bar graphs with shades of gray along the abscissa of each bar graph.

The Applicant is prepared to present an interactive demonstration of a simulation model according to the invention. It would be observed how nodes are interconnected and how each node performs in accordance with the same principle of operation. Nevertheless, the Applicant has canceled the last lines of claim 6 and substituted alternative language within the scope of the invention in order to satisfy the objections of the Examiner.

Claim 6, lines 1 and 2 has been rejected under 35 U.S.C. 112, second paragraph. In response, the offending word "simplifying" has been expunged from the claims. The second temporal dimension reference has also been expunged from the claims. The feedback reference in the claims has now been clarified as to its purpose and relationship, namely to be formed via links among nodes to support reciprocal feedback. Reciprocal feedback is now a specific limitation in claim 6.

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In previous actions, the Fink reference (U.S. Pat. No. 5,808,918), the McAdams reference (U.S. Pat. No. 5,914,891) and the Thalhammer-Reyero reference (U.S. Pat. No. 5,930,154) have been cited for showing system and method for simulating operation of complex biochemical systems, such as genetic systems. None of these references actually contemplate a representation or simulation of complex systems encompassing actual living organisms. Moreover, it is submitted that none of the references in combination suggest the claimed invention. Finally, it is submitted that the foregoing discussion and amendments to the claims are sufficient to maintain distinction over the cited art.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, or if the Examiner would like to observe a demonstration, the Examiner is invited to telephone the undersigned at (650) 326-2400.

Respectfully submitted,

Kenneth R. Allen

Kenneth R. Allen
Reg. No. 27,301

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: (650) 326-2400
Fax: (650) 326-2422
KRA:deh
60335275 v1